REVISED DRAFT
2007 REVIEW OF MONITORING DATA
IRRIGATED LANDS CONDITIONAL WAIVER PROGRAM
13 JULY 2007

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EXECUTIVE SUMMARY

Based on Program monitoring conducted from May 2004 through October 2006, the monitoring information in this 2007 Review provides a general understanding of the baseline water quality conditions in many Central Valley areas of irrigated agriculture. The discussions in this Review inform about data gaps, such as monitoring locations that require further investigation, and also about areas that warrant additional management practice implementation. It also provides insight into the types of water quality concerns that appear to be more pervasive in agricultural drainages within the Central Valley. In addition, source water quality, urban influences, legacy pollutants, and ambient conditions (e.g., air temperature, maintained nature of channels, hydraulic structures, low-flow conditions) contribute to water quality concerns. The stressors causing these impacts may be the result of a variety of factors, including land use, irrigation practices, crop type, land management practices and policies. In most cases, further investigation is necessary in order to understand the causes and develop the solutions. Finally, this review reveals where additional information is needed to help characterize the effects of irrigated agriculture on waters of the State. The information provided in this 2007 Review is summarized below.

Overview of Water Quality Concerns

General observations about water quality conditions in the Central Valley can be made based on three years of monitoring data that was considered in this 2007 Review, as follows:

1. There was less demonstrable toxicity to *Pimephales promelas* (fathead minnow) in tests conducted for Zone 1 than in the other Zones. The percentage of monitoring locations that had toxicity, compared to those that did not, increased as one moves down through the Central Valley. Ammonia is a contaminant that is associated with mortality to the fathead minnow, although high levels of pesticides will also cause minnow toxicity.

2. Toxicity to *Ceriodaphnia dubia* (water flea) was exhibited in a sufficient number of samples to warrant further review in all Zones. Toxicity to the water flea is associated with insecticides at concentrations lower than what would typically affect the fathead minnow. *Ceriodaphnia* is much less sensitive to ammonia than is *Pimephales.*

3. Toxicity to *Selenastrum capricornutum* (algal species) is widespread in the Central Valley. Toxicity to algae is generally associated with herbicides and metals, such as copper. Program monitoring for herbicides and metals began during irrigation season 2006; thus, just one season of data was available for this assessment. Future monitoring results will be needed to determine causes of algae toxicity. The California Rice Commission is undertaking special studies to help determine the causes of algal toxicity in Zone 1.

4. Sediment toxicity occurred in all zones of the Central Valley. Studies conducted by the University of California in the Central Valley strongly suggest that sediment toxicity was caused by pyrethroids, which are replacement pesticides for organophosphates.

5. Predominant pesticides detected in water throughout the Central Valley monitoring sites include chlorpyrifos, diazinon, simazine, diuron, and DDT/breakdown products. Detections are not necessarily exceedances– some detections exceeded water quality trigger limits, while others did not.

6. The toxic effects of organophosphate pesticides, such as diazinon and chlorpyrifos, are found in all Zones. This information is based upon the results of toxicity tests and specific toxicity identification evaluations, and the detection of organophosphate pesticides at levels that exceed known toxicity thresholds for test species.

7. Salinity, as measured by electrical conductivity, is a concern in all Zones of the Central Valley although most notably in Zones 2, 3, and the northwest portions of Zone 4. Information that would clarify how much of this salinity is the result of background, or uncontrollable factors, and how much is contributed by irrigated agriculture is not available, and will require additional study. At this time, there is a concerted effort by many State and local agencies to address issues of salinity in the Central Valley. More information regarding Central Valley Salinity is available at http://www.waterboards.ca.gov/centralvalley/cv-salts/index.html.

8. The presence of pathogen indicators, such as fecal coliform and *E. coli*, are ubiquitous in water samples collected throughout the Central Valley, and are frequently measured at levels higher than the USEPA Recommended Criterion of 235 MPN/100 ml for *E.coli*. Not all strains of *E. coli* are pathogenic, but the presence of *E. coli* or fecal coliform is an indicator of fecal contamination. Several Coalitions have funded studies to determine the probable sources of *E. coli* contamination <u>for specified locations and time periods.</u> The University of California is conducting these studies, which characterize the source type through DNA analyses. Results are not available at this time.

Data Gaps

This review provides information about areas where data gaps exist. The gaps include the type of data that would be necessary to answer questions about water quality in Central Valley agriculture, as well as the locations and/or seasons for which more information would be necessary to provide an adequate assessment. An overview of these data gaps is as follows:

1. <u>Pesticides, Metals, and Nutrients.</u> This 2007 Review provides a baseline for water quality conditions in the various Zones. Approximately half of the monitoring data comes from Coalition group monitoring, which was conducted in two phases, according to the Irrigated Lands program (ILP)

Monitoring and Reporting Program (MRP). The MRP separated the toxicity monitoring (Phase I) from the pesticide, metals and nutrient monitoring (Phase II). The intent of the MRP was for each Phase to be conducted for two consecutive years. Most Coalitions began Phase I monitoring in mid-irrigation season 2004. The fact that toxicity testing and chemical analyses were performed during different phases makes any source identification process much more complex.

2. Status vs. Trend. It should be emphasized that the information in this 2007 Review is not intended to assess changes in water quality resulting from implementation of management practices. The initial 2-3 years of monitoring data collected in the Irrigated Lands Program was primarily meant to provide baseline data for further decision-making. The data submitted by Coalition Groups and summaries that are provided herein suffice, for the most part, to give a baseline for the water bodies that have been monitored. In some cases, where water quality concerns exist, source identification coupled with management practice implementation will need to take place. Subsequent monitoring and reporting to include details on management practice implementation will provide data that could indicate improvements. The inability of the program to assess trends is not a failing of the program or of the Coalitions. Two years is simply an insufficient period to evaluate trends in highly variable water quality characteristics.

3. Standards Applied to Detected Results. Because the Irrigated Lands Conditional Waiver is a general waiver, it does not set forth the designated beneficial uses in each water body, nor the water quality criteria and objectives (i.e, water quality standards that apply to each water body). The applicable water quality standards can vary from water body to water body, and there is a need to determine if measurements are exceeding criteria. The Central Valley Water Board has tentatively identified a process by which it could set forth the beneficial uses by water body according to existing Basin Plan requirements, and thereby identify the limits to be used in implementing the water quality standards. When this process is completed, the true effects of irrigated agriculture on waters of the State will be more clearly defined.

4. Pesticides Applied vs. Pesticides Analyzed. The MRP requires that coalition monitoring include tests of the standard-use pesticides for which analytical methods have been established. The specific list of pesticides is available in MRP Order R5-2008-0833. Regional Board staff has determined that the list of pesticides for which there are established analytical methods is not comprehensive for all the pesticides that are in use in all areas of the Central Valley. A comparison of pesticides used in Zone 4 (Table Z4-1) and the baseline ILP MRP monitoring requirements, shows that not all pesticides are currently included in baseline monitoring. It is also true that approved environmental analytical procedures at environmentally sensitive levels do not exist for all of the pesticides that are registered for use in the State of California. An effective approach to monitor precisely for the pesticides that

are being used has not been developed and will need to be in order to address this data gap.

5. Acute Effects vs. Long-Term Effects. The ILP MRP requires monitoring for the acute effects for aquatic toxicity species, which are primarily mortality and fertilization. Long-term effects, or sub-lethal effects, can be equally as detrimental to species survival, and include factors such as growth and reproduction. Testing for chronic effects is beyond the scope of the approved Conditional Waiver monitoring program requirements.

6. Seasonal Data Gaps. The ILP MRP requires monitoring of two storm events during the winter season, and monthly during irrigation season. The intent of more frequent irrigation season monitoring was to capture the effects of drainage from irrigated lands when water is being applied to the fields and when the application of pesticides takes place. However, data that is not captured includes occasions when drainage occurs from water that is applied for other purposes, such as pre-planting application, post-harvest application, and application of water for frost protection. Additionally, subwatershed areas in Zone 4 have incorrectly interpreted the irrigation season to include only when water is being supplied to the grower by the local irrigation water purveyor, which is an abbreviated period of time, as little as two months. This interpretation excludes monitoring for the remainder of the year, in areas that are quite arid and in which water is often being applied to fields year round.

7. Spatial Data Gaps. There are some areas of the Central Valley for which there is partial or no monitoring data available, or for which representative sites have not been designated. These areas have been identified within each of the Zone report sections. The largest geographical areas for which monitoring sites have not been identified are found in Zones 1 and 4. The Sacramento Valley Water Quality Coalition (Zone 1) is working with ILP staff to develop a long-term approach for monitoring to satisfy program objectives.